

## **Appendix F**

### **Areal Time Series Temperature Tools**

Overall Function: This appendix describes the tools that should be provided in DDAP to compute mean areal temperature (MAT).

PETA Selection: When the Areal Time Series Temperature category is chosen, the user should first be given a list of PETAs that exist for the Basin. The user will then choose the appropriate PETA. How the tools are applied will also depend on whether the HPOR is being analyzed or whether the record is being extended, thus the user will also need to select the period to be worked on from a list of available periods defined for the chosen PETA.

Basic Display: Once the PETA and the period of record have been selected, the basic display for the Areal Time Series Temperature tools window should contain the following in addition to overlay, zoom, query, and units features:

- Basin boundaries - i.e. the overall boundaries of the Basin currently selected as specified in the Basin definition, and
- Watershed boundaries - for all watersheds currently defined for the Basin and PETA.

Menus: Control and Tools menus should be included. The Control menu only needs a Quit option. The tools menu only needs a Compute MAT option. The capabilities that should be included for the Compute MAT tool are described in this appendix starting on a separate page.

## Compute MAT

**Function:** To compute Mean Areal Temperature (MAT) time series for individual Watersheds and also for zones within subdivided Watersheds.

**Input:** (all from previously stored information)

- List of Stations to be used (obtained from stations specified with the Station Selection tool described in Appendix E - list depends on whether the HPOR or an extension) - also observed data, meta data, and existing consistency corrections and  $F_e$  values for each station,
- Indicator as to whether the Basin is to be treated as a mountainous or non-mountainous area (initially set when the Compute MAT tool is first used for the Basin),
- The mean monthly max and min temperature values for the HPOR determined using the Compute Monthly Means tool described in Appendix E - monthly means must be available for all stations (if not, they must be generated first),
- If any Watersheds use synthetic stations, linear relationships between max and min temperature and elevation for each month as defined using the Temperature versus Elevation tool described in Appendix E and maps defining patterns of deviation from those relationship, if defined by the Temperature versus Elevation tool,
- If automatic station weighing is used for any Watersheds (i.e. grid point weights), a boundary definition for each of these Watersheds, and
- Latest information on how stations are to be grouped on consistency check plots (initially defined by the Compute Monthly Means tool described in Appendix E).

**User Specification:**

- Indicator as to whether the Basin is to be treated as a mountainous or non-mountainous area - determines whether  $F_e$  is used in the equation to estimate missing data (only input when the Compute MAT tool is first run for the Basin),
- If a mountainous area, the  $F_e$  values for each station (default value given in Section 6-4 of the Calibration Manual should be assigned with the option for the user to override) - only input for those stations without a previously defined value - can be modified,
- Indicator as to whether to check station consistency or compute MAT values,
- If consistency is being checked, specification of how the stations are to be grouped on the double mass plots if not already defined (currently a max of 5 stations per plot) - if already defined, user can modify (stations not included in any group should be noted),
- If consistency is being checked and this is an extension period, the beginning date of the period to be run (can be prior to or equal to the start of the extension period),
- If MAT values are being computed, the watersheds to be included (user chooses from a list of all watersheds defined - list shows whether time series exist for each watershed for the period selected) - if a watershed is subdivided, MAT values are computed for all zones,
- If MAT values are being computed and the HPOR chosen, the type of station weights to use for each Watershed (grid point or predetermined) - if an extension period, the station weighing method will be the same as used for the HPOR,
  - if grid point weights selected, boundary values must be available for the Watershed and any zones included (boundaries should be available for travel time zones but not for

elevation zones), and

- if predetermined weights selected, the user indicates whether to use synthetic stations or user supplied weights for actual stations (weights must sum to 1.0).

Method: The basic procedure is an updated version of the current historical data MAT program to incorporate the techniques used by the OFS MAT preprocessor function utilizing both max/min and instantaneous temperature data (outlined in Section II.7-OFS-MAT of the NWSRFS User's Manual). The updated historical data MAT program will also have to be modified for inclusion into DDAP. Some of the options to include when the program is incorporated into DDAP are:

- In all cases (i.e. whether consistency being checked or MAT computed),
  - Observation time changes defined in the meta data file for each station are used when reading max and min temperature values,
- If station consistency is being checked, begin with corrections determined using the Compute Monthly Means tool and then,
  - If the HPOR - IDMA method used and new corrections can be added or existing corrections modified,
  - If an extension period - IDMA method used, but corrections can only be added or modified for the extension period,
- If MAT values are being computed,
  - Computational period corresponds to the period chosen (i.e. HPOR or extension), and
  - For Watersheds with predetermined weights and synthetic stations, the default is to assign all the weight to a single synthetic station at the mean elevation of the zone (mean monthly max and min values computed from temperature versus elevation information for the Basin - user defines where to locate the station) - optionally, the user could use more than one synthetic station.

Displays Generated:

- Tabulation similar to that in the current historical data MAT program showing for each MAT area the monthly, yearly, and total run period annual average MAT values, and
- Plot showing the accumulation of MAT values versus time for all areas.

Output:

- Indicator as to whether the Basin is to be treated as a mountainous or non-mountainous area for this PETA (stored when the Compute MAP tool is first used for the Basin and specified PETA),
- MAT time series for the period selected for all specified Watersheds (time series for extension periods are appended to the existing time series for each Watershed),
- Update list indicating for which Watersheds and periods of record MAT time series exist,
- If the HPOR, type of station weights used to compute MAT for each Watershed, and
- Any new values and updates to consistency corrections, how stations are grouped on consistency check plots, and  $F_e$  factors.